

APPENDIX A

Background and History of the HBGS Site
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BACKGROUND AND HISTORY OF THE HBGS

PREVIOUS USE OF THE SITE

The proposed project site exists within a fuel oil storage tank facility constructed in 1961. This tank facility provided a fuel source for the Southern California Edison (SCE) Huntington Beach Generating Station (now owned by AES Huntington Beach, LLC), which began operating in 1958. By the late 1980s, the SCE Generating Station was utilizing primarily natural gas as a fuel source for electric energy generation. Although fuel oils were no longer necessary for operation of the generating facility, SCE was required to maintain a back-up fuel source, and the storage of fuel oils at the tank facility continued. SCE then received notice from the California Independent Systems Operator (ISO) that back-up fuel supplies were no longer necessary, thus eliminating the need for the storage tanks associated with the generating facility. In May 2001, AES Huntington Beach, LLC, owner of the Huntington Beach Generating Station (HBGS), acquired ownership of the fuel oil storage tank area from SCE. The storage tank area contains a total of six tanks, ranging in capacity from 924,000 gallons to 8.64 million gallons. Implementation of the proposed project would require the demolition of three of the six tanks. The three fuel oil storage tanks to be demolished have historically been referred to as the “West”, “North”, and “South” tanks, but for purposes of this analysis, the fuel oil storage tanks will be referenced as follows: Tank 1 (formerly “West”), Tank 2 (formerly “North”) and Tank 3 (formerly “South”)(refer to Exhibit 3-2 for the precise location). Each of these storage tanks is 40 feet high, cylindrical in shape and surrounded by 10 to 15-foot high earthen containment berms, pipelines, pumps, and associated structures. On-site vegetation consists mainly of non-native grasslands and native and non-native low-lying shrubs. The topography of the site is relatively flat, gently sloping to the southwest, with an elevation of approximately five feet above mean sea level (amsl).

HUNTINGTON BEACH GENERATING STATION

Background and History

As stated above, the HBGS began operation in 1958 under the ownership of SCE. The power plant utilized fuel oil for production of electricity through its five generating units until the late 1980s, when the generating units were converted for natural gas operation. In 1995, SCE retired two existing generating units (Units 3 and 4) due to limited use.

AES Huntington Beach, LLC, acquired the HBGS from SCE in 1998, and later acquired the fuel oil storage tank property in 2001. In 2001, AES filed an Application for Certification (AFC) with the California Energy Commission (CEC) to rebuild and upgrade (“retool”) Units 3 and 4 to meet increasing electrical demand in California. The AFC (which was ultimately approved by the CEC in May 2001) and subsequent retool brought the total electrical generation capacity of HBGS to 1,103 megawatts (MW). Until October 2002, Units 1 through 5 were available for operation at the HBGS. However, as part of a South Coast Air Quality Management District (SCAQMD) order, Unit 5 (a combustion turbine unit) was permanently removed from operation, and all permits for this unit were surrendered. As such, current operation at the HBGS consists of four steam turbine generating units with a total capacity of 880 MW.

REGULATORY FRAMEWORK/COMPLIANCE

The energy sector of California is regulated by a number of agencies. The CEC is the principal point of oversight as it relates to major power generating facilities. The CEC has the exclusive authority to certify the construction and operation of thermal electric power plants 50 megawatts or larger and all related facilities in California. The CEC's site certification process provides a timely review and analysis of all aspects of a proposed project, including need, public health and environmental impacts, safety, efficiency, and reliability.

Once operating permits are issued for an electric generating facility, the operating permits are managed by responsible agencies, including: the Regional Water Quality Control Board (storm water and wastewater discharges/NPDES) and the regional air quality management district (air emissions). The power plant applicant is responsible for the periodic renewal of these permits with the applicable responsible agency.

The California Public Utility Commission (CPUC) regulates market behavior and pricing for the power sector in California. The Federal Power Commission (FPC) performs a similar function at the federal level. The ISO regulates the operation of the electric transmission grid and directs the dispatch of generating units to serve the system.

HBGS Operations

AES Huntington Beach, LLC, acquired the HBGS from SCE in 1998, and later acquired the fuel oil storage tank property in 2001. In 2001, AES filed an Application for Certification (AFC) with the California Energy Commission (CEC) to rebuild and upgrade ("retool") Units 3 and 4 to meet increasing electrical demand in California. The AFC (which was ultimately approved by the CEC in May 2001) and subsequent retool brought the total electrical generation capacity of HBGS to 1,103 megawatts (MW). Until October 2002, Units 1 through 5 were available for operation at the HBGS. However, as part of a South Coast Air Quality Management District (SCAQMD) order, Unit 5 (a combustion turbine unit) was permanently removed from operation, and all permits for this unit were surrendered. As such, current operation at the HBGS consists of four steam turbine generating units with a total capacity of 880 MW.

The station uses a once-through cooling system with an offshore intake and outfall. The existing HBGS intake/discharge facilities traverse land owned by the California State Lands Commission (CSLC), and the land is leased to AES. Cooling water is supplied to the generating station from the ocean through an intake structure located 1,840 feet offshore (see Exhibit 3-17, HBGS Intake and Outfall Location Map). The generating station's offshore seawater intake structure consists of a vertical riser with a horizontal velocity cap supported five feet above the opening to the cooling water conduit. The entire structure rises about 15.8 feet above the ocean floor where the total water depth is approximately 34 feet. Cooling water flow varies between 127 MGD and 507 MGD depending on the number of pumps that are in operation. The intake collects seawater at a mean velocity of 2.0 feet per second and conveys the flow through a 14-foot diameter conduit, with screening, to the HBGS intake structure located on the HBGS property. The HBGS intake structure consists of an open forebay from which the seawater flows through two trash racks, each constructed of vertical steel bars with three-inch openings between the bars. Downstream of the trash racks, the water flows through four vertical traveling screens with 3/8-inch mesh screening. The screened seawater is then

conveyed through a 14-foot x 11-foot rectangular conduit into the generating station cooling water pump well structure. The condensers are supplied with cold seawater by eight cooling water pumps (two for each generating unit). Six of the cooling water pumps (Units 1, 2 and 4) are rated at 63.4 MGD (44,000 gallons per minute [gpm]), while the remaining two pumps (Unit 3) are rated at 66.7 MGD (46,300 gpm).

The cooling water pumps convey the screened seawater through thousands of 7/8-inch diameter tubes that make up the generating station's condensers. Steam exiting the facility's turbines, passes over the outer surfaces of the condenser tubes and is condensed back to a liquid state to be pumped back to the boilers.

During this process heat is transferred to the seawater and its temperature is raised, on average, by 18°F (10°C). The maximum temperature increase specified in the facility's NPDES permit is 30°F (16.5°C).

After passing through the condensers, the warmed seawater (cooling water) is returned to the discharge well located at the HBGS intake structure via two 108-inch (nine-foot) diameter discharge pipelines. From the discharge well the cooling water flow is conveyed back to the ocean via a single 1,500-foot long, 14-foot diameter conduit, then through a discharge structure identical to the intake structure except for the absence of a velocity cap. Instead, the discharge vertical riser structure is capped with a 12-inch by 18-inch mesh screen constructed from one-inch by three-inch flat bars.

DESIGN AND OPERATION CRITERIA OF CONDENSER COOLING WATER SYSTEMS

Most industrial production processes need cooling water to operate efficiently and safely. Refineries, steel mills, petrochemical manufacturing facilities, electric utilities and paper mills all rely on equipment or processes that require efficient temperature control. Cooling water systems control these temperatures by transferring heat from the hot process fluids into cool water. At generating stations, such as the HBGS, the process fluid to be cooled is steam after it has passed through the steam turbine and generated power. As the cooling occurs, the cooling water itself gets warmer and must be cooled or discharged and replaced by a fresh supply of cooling water. Where the cooling water is used once and then discharged, the system is known as once-through cooling.

Once-through cooling systems characteristically involve large volumes of water and small increases in water temperature. These systems are usually employed when water is readily available in large volume at low cost. Once-through cooling systems for generating stations are typically operated at a high load factor. They are started several hours prior to startup of the balance of the facility, and are operated several hours after facility shutdown in order to fully cool the steam condensing equipment.

Although simple in design and operation, once-through cooling systems are subject to corrosion, scaling and microbial growth and fouling. Microbial growth and fouling result in energy losses due to increased frictional resistance and increased heat transfer resistance, increased capital costs for excess equipment capacity to account for fouling, increased maintenance costs for replacement of equipment with severe under-deposit corrosion, and shutdowns to clean equipment with loss of production. With respect to the HBGS, the most significant problems are debris plugging the condenser tubes, algae

growth, and mussel growth and the requirement that all three of these are controlled without removing the units from service.

The cleaning methods for bio-fouled (bio-fouling is the attachment of biological materials such as protozoa, amoeba, fungi, and other organisms to surfaces, forming a “bio-film”) systems consist of physical and chemical methods (biocides sanitization). Physical methods are simple but show limited efficacy (flushing) or are effective only for loosely adherent films (backwashing) or for thinner deposits (non abrasive sponge balls). These cleaning methods also require the power generation units to shutdown. The most common approach to bio-fouling problems in cooling water systems is the use of biocides, substances able to drastically reduce the total number of cells in the feedwater and to attack and weaken the stability of the bio-film.

The efficacy of biocides depends on several factors like the kind of biocide and its mechanism of action, its concentration, its kinetics, and the way it is dosed. Research has shown that a continuous bio-fouling monitoring system (on-line and side-stream monitors, visual inspections etc.) and a chlorine dioxide (ClO₂) dosage provides the best results.¹ The HBGS utilizes chlorination, heat treating, and mechanical cleaning to control condenser fouling problems.

There are benefits to continuous operation (as opposed to pumping water only when units are generating electricity) of once-through cooling water systems at facilities such as the HBGS. These include:

- Continuous monitoring and control of steam condenser fouling (bio-film formation);
- Reduction of potential leaching of steam condenser metals (copper) typically caused by shutdowns; and
- Reduction of potential cold shock (loss of thermal plume) to affected aquatic life.

The HBGS is allowed to operate its pumps 24 hours per day, every day under its NPDES discharge permit, issued and monitored by the Santa Ana Regional Water Control Board (SARWQCB).

ALTERNATIVE MODES OF HBGS OPERATION

Currently, HBGS has three distinctive modes of operation: normal (typical) mode, standby mode, and heat treatment mode.

Normal Mode of HBGS Operation

During normal operation mode the generating station produces electricity. The amount of electricity being generated dictates how many units are running. This in turn dictates the condenser cooling water flow rate. The table below shows the cumulative effect on rated

¹ Once-through cooling systems antifouling treatment by ClO₂ M.Belluati 1, L.Bartole 2, G.Bressan 2, (1: Caffaro, Laboratorio Ricerche, via F.Nullo 8, 25126 Brescia [Italy] 2: Dipartimento di Biologia, Università degli Studi di Trieste, via L.Gorgieri 10, 34127 Trieste [Italy].

capacity flow rate based on the number of units running and therefore the number of pumps running. The historical maximum cooling water system flow rate at HBGS is 507 MGD.

**TABLE 4-1
RATED CAPACITY FLOW RATE AT HBGS**

GENERATING UNITS ON-LINE	1	1,2	1,2,4	1,2,3,4
Number of Pumps On-Line	2	4	6	8
Condenser Cooling Water Pump Rated Capacity (MGD)	127	254	380	514

In normal mode, the generating station's discharge is, on average, about 18°F (10°C) above ambient seawater temperature. As mentioned in HBGS regulatory framework, during the normal mode of operation the maximum discharge temperature specified in the facility's NPDES permit is 30°F (16.5°C).

Standby Mode of HBGS Operations

During the HBGS standby mode of operation, a generating unit does not generate electricity. However, the station's equipment is operated at a level of readiness that allows the unit to begin generating electricity on short notice. While in standby mode, the generating station may discharge only 127 MGD of seawater (the equivalent of one unit/two pumps on-line). If the HBGS is not generating electricity and is in standby mode, the temperature of the discharge is approximately the same as the ambient seawater temperature entering through the intake. The frequency and duration of standby mode operation is driven by the grid's demand for electricity. Historically, this scenario has occurred less than one percent of the time.

Heat Treatment Mode of HBGS Operations

HBGS periodically conducts a heat treatment procedure to further control the growth of bio-fouling organisms that attach to the walls of the generating station intake structure and cooling water conduits. The larger bio-fouling organisms or macro-fouling organisms (primarily barnacles and mussels in the case of HBGS) attach themselves to surfaces within the cooling water system and can restrict water flow and interfere with the operation of facility equipment (pumps, valves, etc.). If the shells of these organisms are detached from the substrate, they can be carried by the cooling water flow to the condensers where they can clog tubes and degrade the performance of the condensers. Heat treatments are typically completed once every six to eight weeks. The entire procedure takes about six to eight hours to complete. Heat treatment is a routine operation at many of California's coastal generating stations and is permitted and regulated under the HBGS' NPDES permit conditions.

The main goal of heat treatment is to remove the marine organisms that have settled within the generating station's cooling water system while they are still small enough to detach and pass through the condenser tubes without clogging the tubes. During heat treatment, flow is reversed within the cooling water system and seawater is drawn into the system via the discharge conduit and discharged out of the intake conduit. Only a very small amount of seawater flow is actually taken from the ocean during this process, and most of the cooling water flow is circulated within the generating station system rather than discharged from the generating station. By recirculating the seawater flow

through the condensers, rather than discharging it to the ocean, the seawater temperature in the recirculation loop is raised from ambient ocean water temperature to approximately 110–115°F (43–46°C). The elevated water temperature removes the marine organisms within the system, which are then discharged through the intake structure.

HBGS HISTORICAL OPERATIONS

As stated above, the HBGS has been in operation since 1958. All four generating units were on-line until 1995. At that time Units 3 and 4 were taken off-line due to limited use. Units 3 and 4 were retooled and brought back on-line in 2002 and 2003, respectively. The HBGS facility flow rate from the period 1979 through 2002 (prior to retooling) averaged 234 MGD, with a low flow of 127 MGD. From 2002 to July 2003 (during and subsequent to retooling) the average flow rate has increased to 265 MGD, with a low flow of 127 MGD. From 1980 through July 2003, HBGS pumps have been in operation approximately 98.8% of the time. Like all large facilities, there are scheduled outages so that maintenance needs can be performed on the system (refer Appendix K, Hydrodynamic Modeling Report).